What is claimed is:

1. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support;

(b) a gas distributor;

(c) a gas energizer;

(d) a window comprising a transparent plate and an overlying mask with an aperture; and

(e) an exhaust,

whereby a substrate held on the support is processed by process gas distributed by the gas distributor, the process gas being energized by the gas energizer and exhausted by the exhaust, and whereby the mask on the window reduces deposition of process residue on the window and light is transmitted through the aperture of the mask and the transparent plate.

2. The process chamber of claim 1 wherein the mask comprises an aperture having an aspect ratio that is sufficiently large to reduce access of process gas to the transparent plate.

3. The process chamber of claim 1 wherein the mask comprises an aperture having an aspect ratio of from about 1:1 to about 12:1.

4. The process chamber of claim 1 wherein the mask comprises an aperture having an aspect ratio that is sufficiently small to allow ions of the energetic process gas to enter the aperture and etch away the process residues formed on a sidewall of the aperture and on the transparent plate.

5. The process chamber of claim 1 wherein the mask comprises an aperture having an aspect ratio of from about 0.25:1 to about 3:1.

6. The process chamber of claim 1 wherein the mask comprises an aperture having a diameter or width of from about 0.1 to about 50 mm, and a height of about 0.5 to about 500 mm.

7. The process chamber of claim 1 wherein the mask comprises an array of hexagonal apertures.

8. The process chamber of claim 1 wherein the mask comprises a material that is resistant to erosion by the process gas.

9. The process chamber of claim 8 wherein the mask comprises one or more of Al_2O_3, SiO_2, AlN, BN, Si, SiC, Si_3N_4, TiO_2, or ZrO_2.

10. The process chamber of claim 1 further comprising an electrical field source that couples electrical energy to the window to reduce deposition of the process residues on the window.

11. The process chamber of claim 1 further comprising a magnetic field source adapted to provide a magnetic flux across the window to reduce the deposition of process residues on the window.

12. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support having a receiving surface for supporting a substrate;

(b) a gas distributor having gas inlet holes for providing process gas to the process chamber and a gas energizer that is capable of coupling energy to the process gas;

(c) a window that allows light to be transmitted therethrough to monitor processing of the substrate;

(d) means for reducing deposition of process residue from process gas on the window; and

(e) an exhaust that exhausts process gas from the process chamber.

13. The process chamber of claim 12 wherein the means for reducing deposition of process residue on the window comprises means for controlling the access of energized process gas species to the window.

14. The process chamber of claim 12 wherein the means for reducing deposition of process residue on the window comprises masking means that masks the window from the energized process gas.

15. The process chamber of claim 12 wherein the means for reducing deposition of process residue on the window comprises an overlying mask having apertures with an aspect ratio of from about 1:1 to about 12:1.

16. The process chamber of claim 15 wherein the mask comprises an aperture having an aspect ratio of from about 0.25:1 to about 3:1.

17. The process chamber of claim 12 further comprising an electrical field source that couples electrical energy to the window to further reduce deposition of process residues on the window.

18. The process chamber of claim 12 further comprising a magnetic field source adapted to provide a magnetic flux across the window to further reduce the deposition of process residues on the window.

19. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support;

(b) a gas distributor;

(c) a gas energizer;

(d) light transmitting means for transmitting light to and from the process chamber during processing of a substrate;

(e) means for reducing deposition of process residue on the light transmitting means; and

(f) an exhaust,

whereby a substrate held on the support is processed by process gas distributed by the gas distributor, energized by the gas energizer, and exhausted by the exhaust, and the means for reducing deposition of process residue on the light transmitting means allows light to be transmitted through the light transmitting means to monitor processing of the substrate.

20. The process chamber of claim 19 wherein the means for reducing deposition of process residue comprises means for limiting access of energized process gas to the light transmitting means.

21. The process chamber of claim 19 wherein the means for reducing deposition of process residue comprises masking means that masks the energized process gas from the light transmitting means.

22. The process chamber of claim 19 wherein the means for reducing deposition of process residue comprises a mask covering the light transmitting means, the mask having apertures with an aspect ratio of from about 0.25:1 to 12:1.

23. The process chamber of claim 19 further comprising a process monitoring system that monitors light transmissions passing through the aperture in the mask overlying the window.

24. A method of processing a substrate in a process chamber, the method comprising the steps of:

(a) placing the substrate in the process chamber;

(b) maintaining first process conditions in the process chamber to process the substrate, the first process conditions including providing an energized process gas in the process chamber;

(c) masking a window in a wall of the process chamber and measuring a property of light transmitted through the window; and

(d) changing the first process conditions to second process conditions in relation to the measured property of the transmitted light.

25. A method according to claim 24 further comprising the step of directing an incident light beam through the window to be incident on the substrate and measuring a property of a reflected light beam that is reflected from the substrate and transmitted through the window.

26. A method according to claim 24 wherein the first process conditions comprise process conditions suitable for etching the substrate, and the second process conditions comprises process conditions suitable for stopping the etching process or changing a rate of etching of the substrate.

27. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support;

(b) a gas distributor;

(c) a gas energizer;

(d) a window in a wall of the process chamber;

(e) a magnetic field source adapted to provide a magnetic flux across the window; and

(f) an exhaust;

whereby a substrate held on the support is processed by the energized process gas thereby forming process residues in the process chamber, and whereby the magnetic flux across the window reduces the deposition of the process residues on the window.

28. The process chamber of claim 27 wherein the magnetic field source provides a magnetic flux having higher density across the window than across other portions of the chamber.

29. The process chamber of claim 27 wherein the magnetic field source comprises one or more magnetic poles disposed about a perimeter of the window.

30. The process chamber of claim 27 wherein the magnetic poles that face one another around the perimeter of the window comprise opposing magnetic polarities.

31. The process chamber of claim 27 wherein magnetic field source comprises an aperture and provides a magnetic field across the aperture.

32. The process chamber of claim 27 wherein the magnetic field source comprises at least one permanent magnet or electromagnet adjacent to the window.

33. The process chamber of claim 27 wherein the magnetic field source comprises an annular yoke having a hole sized to allow light to pass through the window.

34. The process chamber of claim 27 wherein the magnetic field source comprises a magnet or electromagnet arranged to provide a magnetic field component that is parallel to the plane of the window.

35. The process chamber of claim 27 wherein the magnetic field source is adapted to provide a magnetic field that extends across substantially an entire surface of the window.

36. The process chamber of claim 27 wherein the magnetic field source is adapted to provide a magnetic field that terminates at about the edges of the window.

37. The process chamber of claim 27 wherein the magnetic field source provides a magnetic field of from about 10 to about 10,000 Gauss.

38. The process chamber of claim 27 further comprising a mask covering the window, the mask comprising an aperture that allows light to pass through.

39. The process chamber of claim 27 wherein the mask comprises an aperture having an aspect ratio of from about 0.25:1 to about 12:1.

40. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support;

(b) a gas distributor;

(c) a gas energizer;

(d) a window in a wall of the process chamber, the window being transparent to particular wavelengths of light;

(e) means for maintaining a magnetic flux across the window; and

(f) an exhaust that exhausts the process gas from the chamber;

whereby a substrate held on the support is processed by the energized process gas thereby forming process residues in the process chamber, and whereby the means for maintaining a magnetic flux across the window reduces deposition of process residues on the window.

41. The process chamber of claim 40 wherein the means for maintaining a magnetic flux across the window provides a magnetic flux having magnetic field components that substantially prevent charged process gas species from reaching the window.

42. The process chamber of claim 40 wherein the means for maintaining a magnetic flux across the window provides a magnetic flux that extends across substantially an entire surface of the window.

43. The process chamber of claim 40 wherein the means for maintaining a magnetic flux across the window comprises a magnet or an electromagnet.

44. The process chamber of claim 40 wherein the means for maintaining a magnetic flux across the window further comprises means for allowing light to pass through the magnetic flux means.

45. The process chamber of claim 40 wherein the means for maintaining a magnetic flux across the window provides a magnetic field of from about 10 to about 10,000 Gauss.

46. A method of processing a substrate in a process chamber, the method comprising the steps of:

(a) placing the substrate in the process chamber;

(b) maintaining process conditions in the process chamber to process the substrate, the process conditions including providing an energized process gas in the process chamber; and

(c) maintaining a magnetic flux across a window in a wall of the process chamber.

47. A method according to claim 46 wherein step (c) comprises the step of maintaining a magnetic flux that is sufficiently high to reduce the deposition of process residue on the window.

48. A method according to claim 46 wherein step (c) comprises the step of maintaining a magnetic flux having a magnetic field component that is substantially parallel to the plane of the window.

49. A method according to claim 46 wherein step (c) comprises the step of maintaining a magnetic flux that is localized across the window, and comprises a higher magnetic flux across the window than across other portions of the chamber.

50. A method according to claim 46 wherein step (c) comprises the step of maintaining a plurality of magnetic poles about a perimeter of the window.

51. A method according to claim 46 wherein step (c) comprises the step of maintaining opposing magnetic poles that face one another around the perimeter of the window.

52. A method according to claim 46 wherein step (c) comprises the step of maintaining a magnetic flux having a magnetic field component that is substantially parallel to the plane of the window.

53. A method according to claim 46 wherein step (c) comprises the step of maintaining a magnetic flux that extends across substantially an entire surface of the window and terminates at about the edges of the window.

54. A method according to claim 46 further comprising the step of providing a mask covering the window, the mask comprising an aperture that allows light to pass through.

55. A method of processing a substrate in a process chamber, the method comprising the steps of:

(a) placing the substrate in the process chamber;

(b) maintaining first process conditions in the process chamber to process the substrate, the first process conditions including providing an energized process gas in the process chamber;

(c) maintaining a magnetic flux across a window in a wall of the process chamber;

(d) measuring a property of light transmitted through the window; and

(e) changing the first process conditions to second process conditions in relation to the measured property of the transmitted light.

56. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support;

(b) a gas distributor;

(c) a gas energizer;

(d) a window in a wall of the process chamber;

(e) an electrical field source that couples electrical energy to the window; and

(f) an exhaust that exhausts the process gas from the chamber;

whereby a substrate held on the support is processed by the energized process gas thereby forming process residues in the process chamber, and whereby the electrical energy coupled to the window reduces deposition of the process residues on the window.

57. The process chamber of claim 56 wherein the electrical field source electrically biases the window thereby causing energized process gas ions to energetically bombard the window and remove process residues deposited on the window.

58. The process chamber of claim 56 wherein the electrical field source is adapted to provide an electrical field that extends across a surface of the window and terminates before the edges of the window.

59. The process chamber of claim 56 wherein the electric field source comprises an electrode or coil adjacent to the window.

60. The process chamber of claim 59 wherein the electrode or inductor coil disposed provides an electrical flux having an electrical field component that is perpendicular to the plane of the window.

61. The process chamber of claim 59 wherein the process chamber further comprises an inductor antenna and the electrode comprises apertures positioned to reduce eddy currents induced by electrical energy coupled from the inductor antenna.

62. The process chamber of claim 59 wherein the electrode comprises an aperture sized to allow light to pass therethrough.

63. The process chamber of claim 59 wherein the electrode comprises a disc having at least one radially extending slot.

64. The process chamber of claim 56 wherein the process chamber further comprises an electrical current source that electrically powers the electrical field source with one of a D.C., A.C., or RF current.

65. The process chamber of claim 56 wherein the electrical current source comprises an inductor coil and a tap connecting a selected winding of the inductor coil to the electrode.

66. The process chamber of claim 56 wherein the electrical current source biases the electrode with a voltage of from about 20 to about 4000 volts.

67. A process chamber for processing a semiconductor substrate, the process chamber comprising:

(a) a support;

(b) a gas distributor;

(c) a gas energizer;

(d) a window in a wall of the process chamber, the window being transparent to particular wavelengths of light;

(e) means for electrically biasing the window;

(f) an exhaust that exhausts the process gas from the chamber;

whereby a substrate held on the support is processed by the energized process gas thereby forming process residues in the process chamber, and whereby the means for electrically biasing the window reduces deposition of process residues on the window.

68. The process chamber of claim 67 wherein the means for electrically biasing the window causes energized process gas ions to energetically bombard the window and remove process residues formed on the window.

69. The process chamber of claim 67 wherein the means for electrically biasing the window provides an electrical field that extends across substantially an entire surface of the window.

70. The process chamber of claim 67 wherein the means for electrically biasing the window comprises an electrode or coil adjacent to the window.

71. The process chamber of claim 67 wherein the means for electrically biasing the window further comprises means for reducing eddy currents induced in the electrical biasing means.

72. A method of processing a substrate in a process chamber, the method comprising the steps of:

(a) placing the substrate in the process chamber;

(b) maintaining process conditions in the process chamber to process the substrate, the process conditions including providing an energized process gas in the process chamber; and

(c) electrically biasing a window in a wall of the process chamber.

73. A method according to claim 72 wherein step (c) comprises the step of electrically biasing the window by a voltage that is sufficiently high to reduce the deposition of process residue on the window.

74. A method according to claim 72 wherein step (c) comprises the step of electrically biasing substantially a surface of the window.

75. A method according to claim 72 wherein step (c) comprises the step of maintaining an electrode or coil adjacent to the window, the electrode or coil being sized to provide an electrical flux across the surface of the window.

76. A method according to claim 75 comprising the step of powering the electrode or coil with one of a D.C., A.C., or R.F. current.

77. A method according to claim 72 further comprising the steps of measuring a property of light transmitted through the window, and changing the process conditions in relation to the measured property of the transmitted light.

78. A method of processing a substrate in a process chamber, the method comprising the steps of:

(a) placing the substrate in the process chamber;

(b) maintaining process conditions in the process chamber to process the substrate, the process conditions including providing an energized process gas in the process chamber; and

(c) providing a window in a wall of the process chamber; and

(d) maintaining an electrical flux across the surface of the window in the process chamber, the electrical flux having an electrical field component that is perpendicular to the plane of the window.